CLAIMS

What is claimed is:

1. An apparatus for characterizing a void in a first scan target associated with a sample, the sample having a first surface and a second surface, the apparatus comprising:

an x-ray emission inducer configured to scan a first scan target, the x-ray emission inducer causing the first scan target to emit x-rays from the first surface;

an x-ray emission detection system configured to obtain a measurement of the x-rays emitted from the first surface of the sample, wherein the x-ray measurement is compared to a control measurement to characterize a void in the first scan target.

2. The apparatus of claim 1, further comprising a stage configured to secure the sample, wherein the stage is configured to position the sample relative to the x-ray emission inducer.

3. The apparatus of claim 2, wherein positioning the sample comprises rotating the sample.

4. The apparatus of claim 2, wherein the first scan target comprises a via.

5. The apparatus of claim 4, wherein the sample is a wafer comprising a plurality of integrated circuits.

6. The apparatus of claim 1, wherein the x-ray emission detection system is configured to detect x-rays with a first emission energy corresponding to a first material.

7. The apparatus of claim 6, wherein the first material comprises Cu.

8. The apparatus of claim 7, wherein the x-ray emission detection system is further configured to detect x-rays with a second emission energy corresponding to a second material.

9. The apparatus of claim 8, wherein the second material comprises Ta.

10. The apparatus of claim 9, wherein the control measurement is obtained by scanning an adjacent scan target.

11. A system for characterizing voids associated with a sample, the sample having a first surface and a second surface, the system comprising:

memory;

a processor coupled with memory, the processor configured to identify a first measurement of induced x-ray emissions characteristic of a first material at a first scan target, identify a control measurement, and provide the first measurement and the control measurement for comparison to thereby obtain information for characterizing a void associated with the first scan target in the sample.

12. The system of claim 11, wherein the first material has low resistivity.

13. The system of claim 12, wherein the first material is copper.

14. The system of claim 11, wherein the sample is a wafer comprising a plurality of integrated circuits.

15. The system of claim 11, further comprising identifying a second measurement of x-ray emissions characteristic of a second material.

16. The system of claim 11, wherein the second material is a barrier material.

17. The system of claim 16, wherein the second material is Ta.

18. The system of claim 11, wherein characterizing voids associated with the sample comprises determining the size and location of a void.

19. The system of claim 11, wherein the control measurement is obtained by scanning an adjacent scan target.

20. The system of claim 19, wherein the scan target is a via.

21. The system of claim 20, wherein the adjacent scan target is an adjacent via.

22. The system of claim 21, wherein the control measurement is obtained by scanning adjacent vias in the +x, -x, +y, and -y positions.

23. The system of claim 22, wherein the control measurement is obtained by scanning adjacent vias in the +2x, -2x, +2y, and -2y positions.

24. A method for characterizing a void in a sample, the method comprising:

identifying a first measurement of induced x-ray emissions characteristic of a first material at a first scan target.

identifying a control measurement;

providing the first measurement and the control measurement for comparison to thereby obtain information for characterizing a void associated with the first scan target in the sample.

25. The method of claim 24, wherein the first material has low resistivity.

26. The method of claim 25, wherein the first material is copper.

27. The method of claim 24, wherein the sample is a wafer comprising a plurality of integrated circuits.

28. The method of claim 24, further comprising identifying a second measurement of x-ray emissions characteristic of a second material.

29. The method of claim 24, wherein the second material is a barrier material.

30. The method of claim 29, wherein the second material is Ta.

31. The method of claim 24, wherein characterizing voids associated with the sample comprises determining the size and location of a void.

32. The method of claim 24, wherein the control measurement is obtained by scanning an adjacent scan target.

33. The method of claim 32, wherein the scan target is a via.

34. The method of claim 33, wherein the adjacent scan target is an adjacent via.

35. The method of claim 34, wherein the control measurement is obtained by scanning adjacent vias in the +x, -x, +y, and -y positions.

36. The method of claim 35, wherein the control measurement is obtained by scanning adjacent vias in the +2x, -2x, +2y, and -2y positions.

37. An apparatus for characterizing a void in a sample, the apparatus comprising:

means for identifying a first measurement of induced x-ray emissions characteristic of a first material at a first scan target.

means for identifying a control measurement;

means for providing the first measurement and the control measurement for comparison to thereby obtain information for characterizing a void associated with the first scan target in the sample.

38. The apparatus of claim 37, wherein the control measurement is obtained by scanning an adjacent scan target.

39. The apparatus of claim 38, wherein the adjacent scan target is an adjacent via.

40. The apparatus of claim 39, wherein the control measurement is obtained by scanning adjacent vias in the +x, -x, +y, and -y positions.

41. The apparatus of claim 40, wherein the control measurement is obtained by scanning adjacent vias in the +2x, -2x, +2y, and -2y positions.